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AN EXHIBIT ILLUSTRATING THE HISTORY OF ANATOMY

INTRODUCTION

May 2, 1933, an exhibit was opened in the Exhibition Room of the Institute of the History of Medicine, which was a part of a seminar course on the History of Anatomy and Physiology. The course was attended by a group of first-year medical students. Each student, or two together, devoted their special attention to a definite period in the history of anatomy. They read a paper on the subject which was discussed by the class, and at the end of the course they prepared a section of the exhibit illustrating their special field. The exhibit, therefore, is entirely the work of the students. They made the selection of the pictures and books to be exhibited; they wrote the legends to the exhibited objects, and they wrote this catalogue.

H. E. S.

ANATOMY IN EARLY CIVILIZATIONS

(Case 1)

Primitive

NE must suppose that when our probable ancestors, the men of Piltdown and of Heidelberg, were alive some five hundred thousand years ago, they were endowed with what Charles Singer has called the "anatomical instinct." As the tiger lunged for the vulnerable neck of his prey, or the ichneumon fly nicely crippled a victim's nervous system, so must primitive man have had some knowledge of anatomy. Killing for self-defence and for food, he came to know the position of an animal's vital organs (see the elephant from the Asturian caves); and as he became more civilized, the preparation of a carcass for a meal must have been instructive. A smattering of human anatomy was forthcoming from the examination of war-wounds, from the torture of prisoners, cannibalism, and human sacrifice. Of course, any such learning was incidental to the routine of primitive life; indeed, only during the last twenty-five hundred years has anatomy been studied for its own sake.

More primitive men may have depicted animal forms in wood or some such perishable medium, but it was not until the time of the last (fourth) Ice Age that there began to be left records which have come down to us. The vicissitudes of the Aurignacian period (roughly 50,000 to 30,000 B. C.) must have had a stimulating effect on the men of eastern Europe, for their bone carvings and their wall-paintings are quite marvelous. The caves of southwestern France and northern Spain are particularly rich in this heritage. In colours of black, ochre, brown, red, and white we find portrayed the wild boar, bison, mastodon, bear, and reindeer with a simplicity and a sense of motion which could have been achieved only by an artist with an acute, if instinctive, knowledge of animal anatomy; such movement was not attained again until the Italian Baroque period. The inspiration for these works we can only surmise. They may have served merely as pastimes of cave life during the rigors of the Glacial Age; or perhaps the Aurignacian hunters felt that by making accurate drawings of their quarry they thereby gained some power over it.

To this same late Glacial period belong the earliest figures representing the human form. In 1908 there was unearthed from a loess on the left bank of the Danube a four and one-half inch limestone statuette which is known as the "Venus of Willendorf." The form is that of a woman with gigantic breasts and buttocks; the face is bowed down and hence is indistinguishable. The head is decked with what are possibly the shells of mussels, symbolical of the female sex organs. Because of these facts, and because contemporary representations of male figures attest the ability of Palaeolithic artists to copy the true proportions of the human body (see the relief from Laussel), commentators assign a symbolical meaning to the Venus of Willendorf. Probably she is *Woman*, and suggests a physiological as well as an anatomical conception in the mind of her sculptor. Similar figures by Crô-Magnon artists have been discovered in Malta.

PALMER FUTCHER.

Babylonia

Although their contributions to medical learning were not extensive, it is of interest to us that the Babylonians fashioned the oldest extant model of a visceral organ. Perhaps a word of explanation would be apropos. This people believed that, inasmuch as sickness was a supernatural visitation, the first step in curing it should be to ascertain the will of the gods; this end could best be gained by an animal sacrifice. As the liver was the supposed seat of the soul and hence was in closest association with the deities, it was in that organ of the dead offering that the divine intentions would be signified. Hence, from 3000 B.C. the Babylonian physician-prists studied carefully the livers of the sheep which they had sacrificed. They came to recognize its right and left lobes, which they termed the "wings," the umbilical groove (the "river of the liver"), the two appendages, the larger of which was designated the "finger of the liver," the gall-bladder (the "bitter part"), and other details of its structure. Any deviation from the normal appearance they considered significant. Thus, if a marking on one of the lobes suggested the symbol of one of the gods, it signified that that deity had to do with the affairs of the patient in whose behalf the ritual was being conducted. Similarly, a long bile-duct meant long life and a long

"finger" presaged happiness. Once this "diagnosis" was made, the priests proceeded to treat the patient chiefly by incantations. The system was a complicated one, and probably for reference purposes they made clay models of the sheep's liver with inscriptions pointing out the prophetic significance of its various parts. The Institute of the History of Medicine has procured a copy of such a model which is now in the British Museum; it probably dates from about 2000 B. C. (The cuneiform inscriptions upon the lobes of the original do not appear in our copy.) It is interesting that this ritual of hepatoscopy was practised by primitives in Burma, Borneo, and Uganda as well as in Babylonia. The rite was subsequently observed by the Greeks and Romans, with whom the liver came to be replaced by the heart as subject. All of this is illustrative of the fact that it was possible to acquire a considerable knowledge of the anatomy of certain isolated organs without entailing a truly didactic approach to the subject.

PALMER FUTCHER.

Egypt

Our knowledge of Egyptian medicine is derived in the main from papyri which are from three to four thousand years old. Other sources such as contemporary pictures and the well-known account of Herodotus give us a more complete insight as to the state of anatomy and physiology at this time. Among the papyri two stand out pre-eminently: the so-called Ebers Papyrus and the Edwin Smith Papyrus.

The former, which was discovered in 1872, dates back to 1550 B. C. It is concerned almost entirely with clinical medicine, and is filled with various prescriptions employing a vast number of drugs and potions. Of interest to us is a section on the heart. Here mention is made of the vessels which go to the organ from the different parts of the body and "each physician feels all these when he places his finger upon the head, scalp, hands, epigastrium, legs or arms. He traces all from the heart because its vessels go to all its members; so he describes it as the beginning of the vessels to all members."

The oldest known surgical treatise is the aforementioned Edwin Smith Papyrus, which was probably compiled in the Old Kingdom. It consists of forty-eight systematically arranged cases to which a favorable, uncertain, or unfavorable prognosis is appended. Many anatomical

and physiological facts were observed. The word *Brain* appears for the first time; it was likened to "the corrugations arising in molten slag." Its relationship to other parts of the body was noted, and the injured spinal column and its manifestations were described. The pulse seemed to be "a fluttering under the finger like the weak place in an infant's crown before it becomes whole." The heart was seen as the center of distributing vessels. Thus an unusual knowledge is found when the various cases are read in turn.

As is well known, embalming reached a peak in Egyptian days. Our firsthand information comes from Herodotus, who travelled extensively in Egypt, and tells us the various procedures used by the natives. Thus from this a certain amount of practical anatomical knowledge was gained. Although the contributions of Egypt are to us today looked upon as unimportant, its influence upon Greek medicine must have been great, and it was probably one of the important factors that led to such an unusual progress in Greece.

RICHARD FOLLIS, JR.

China

The Chinese early elaborated and indeed still subscribe to a complicated anatomical system, the canons of which were collected in a medical treatise of the late Chou Dynasty (1122–249 B. C.) named the *Nei Ching*. This conception was built about a fabulous hierarchy of feudal and intersocial relations between the various organs of the body. We find here an illustration of the old story that Philosophy combines with Medicine generally to the disadvantage of the latter; the practical and effective is swamped by the elaborate and theoretical. There has been little if any scientific investigation in the whole history of native Chinese anatomy down to the present day. (An interesting operation which the Chinese perform as a panacea is "acupuncture," involving the insertion of needles more or less deeply into affected organs. The diagrams mapping the regions of the body to be punctured show that Chinese physicians have come to learn the course of the more superficial blood vessels.) Japanese medicine and anatomy sprang from the same stock as Chinese and ran practically the same course until the early nineteenth century, when there began what has proved to be a quite wide diffusion of European scientific learning.

PALMER FUTCHER.

[*Case 1*]

ELEPHANT

Wall-painting in red from an Asturian (North Spain) cave of the Aurignacian period (roughly 50,000 to 30,000 B. C.). On the animal's side is one of the earliest representations of a visceral organ—probably the heart, whose position was of consequence to Palaeolithic hunters.

CHARGING BISON

Aurignacian wall-painting from the caves of Altamira (North Spain). The artist's acute sense of movement entailed a knowledge of animal anatomy.

RUNNING BOAR

Also from Altamira.

"VENUS OF WILLENDORF"

Four-and one-half inch limestone statuette of the Aurignacian period (50,000 to 30,000 B.C.) found in 1908 near the village of Willendorf on the Danube. This is one of the earliest likenesses of the human form which is known to us.

FIGURES OF A MAN AND WOMAN

From the Palaeolithic caves of Laussel in southwest France. The woman holds a drinking-horn. Obesity in females seems to have been highly acceptable to Crô-Magnon men.

BABYLONIAN MODEL OF SHEEP'S LIVER

Copy of specimen in the British Museum—the oldest extant model of a visceral organ, dating from about 2000 B. C. The cuneiform inscriptions on the original are not reproduced.

CHINESE ACUPUNCTURE DIAGRAM

From an ancient Chinese anatomical chart. There are designated the names and locations of some of the three hundred odd points to be needled in treating various ailments.

PAGE FROM THE EDWIN SMITH PAPYRUS

Edited by James H. Breasted. It was acquired in 1862 at Thebes.

WALL RELIEF OF ABOUT 2600 B.C.

Showing an operation for hydrocele or circumcision. One of the first pictured representations of surgical procedure.

ANATOMY IN GREECE AND ROME

(Case 2)

N THE history of ancient Greek anatomy, one must distinguish three periods. First, the pre-Hippocratic time; second, the time of the Hippocratic writings—that is, about 400 B. C.; third, the time from the foundation of the school of Alexandria, until the end of ancient Greek culture—that is, until about 600 A. D.

We do not know much about anatomical knowledge of the pre-Hippocratic time. We may guess that it was similar to what other archaic cultures, as those in Babylonia and Egypt, knew about anatomy. It is even possible that Greek anatomy of those times was influenced by these cultures. The knowledge did not go far beyond what could be found out by sacrificing animals, and by accidental observations of wounded men on the battlefield. In any case, this knowledge was not systematized.

The Hippocratic writings show us that the physicians of the time in question were very much interested in anatomy. Their chief interest was devoted to the vessels. Since they thought that all diseases were caused by various humours, the question arose, how these humours were spread over the body. But inasmuch as the humoural theory was speculative, the anatomy of the vessels was largely imaginative. Thus, for instance, one of the authors thought that epilepsy was caused by a flux of phlegm, and that all the phenomena of epileptic attacks could be explained by the entrance of phlegm into the blood vessels. According to this hypothesis, he described a system of blood vessels, saying that from all parts of the body small vessels went up to the brain, and that a part of these could be found to be two large vessels, one from the liver and another one from the spleen, both ending in the brain. Thus, the anatomical conceptions wholly depended on the author's individual pathological views. It can be concluded that dissections of human bodies were not made, but some of the physicians who tried to put their hypothesis on a more convincing basis, started making dissections of animals, and then by way of analogy applied their findings to the human body. The surgeons, it is true, had sometimes a rather good

knowledge of the bones and ligaments, but this knowledge does not exceed what they could have learned by practice.

Aristotle must be considered as the founder of more scientific methods. He tried to limit the method of analogy. His principles were followed by the physicians of the school of Alexandria, which was founded in about 300 B. C. There we find two great anatomists—Erasistratus and Herophilus—who might have dissected even human bodies. They found out very important facts about the anatomy of the nerves, the vessels of the brain, the structure of the viscera, etc. They established comparative anatomy, and we know that they dissected various kinds of animals, and described the differences between them. Thus, the school of Alexandria, from then on, was the center of anatomical teaching, and it retained its influence until the end of ancient history. Galen, who lived in the second century A. D., says that Alexandria was the only place where a complete human skeleton could be found. And he therefore strongly advised his pupils to go there if they wanted to learn osteology. Galen himself was the last great anatomist of antiquity. He had studied in Alexandria, then he went to Rome, and there he used to make dissections on animals, and demonstrate physiological experiments. Among his writings we find a big work on anatomical dissections which shows us that many of the important facts of macroscopic anatomy were known to him. We also see from it that he did not dissect the whole body systematically, but that he had different methods of dissection depending on the organ which he wanted to demonstrate.

Galen soon became an authority in the whole field of medicine, and as regards anatomy, no progress beyond his findings was made. On the contrary, the next centuries confined themselves to compilations from his writings, and the Arabic writers who became the successors of the Greek, did the same. For more than a thousand years the authority of Galen was unshaken, and only as late as the 16th century was it detected that his knowledge of anatomy had been gotten chiefly from animals, and that a new anatomy of the human body was founded.

OWSEI TEMKIN.

[*Case 2*]

ANATOMY IN GREECE AND ROME

REPRODUCTIONS OF VOTIVES

A bronze model of the upper part of the face, and the upper body of a skeleton, from the Rupert Norton Collection in the Institute.

SYSTEMS OF BLOOD VESSELS

Three drawings giving the different systems of blood vessels as described by Diogenes of Apollonia (5th century B. C.), Polybius (beginning of 4th century B. C.), and Aristotle.

HIPPOCRATES

Title pages of the editions of Hippocratic collections: of Basel, 1526, and Leyden, 1665.

GALEN (Basilas, H. Frobenius, 1562).

Title page of Latin translation of Galen's works, showing Galen dissecting a pig.

HIPPOCRATES

A picture from the illustrated commentary of Apollonius of Kitium, on a surgical work of Hippocrates, showing Byzantine representation of muscles.

SKELETON

Representation of a human skeleton on a Greek vase. From Eugen Holländer's *Plastik und Medizin*.

THE ALEXANDRIAN SCHOOL—CELSUS

After the death of Alexander, in 323 B. C., the center of medical knowledge, as of much of Greek culture, shifted from Athens to the already thriving city of Alexandria. Here a new school of medical teaching grew up, which remained for centuries important in the education of physicians. Unfortunately, the two men in this school who made the most outstanding contributions, Herophilus and Erasistratus, are known to us only through references in Galen and other later writers. Herophilus, who lived early in the 3rd century B. C., was primarily an anatomist and made considerable contributions to the study of the brain and nerves. Erasistratus, more of a physiologist, carried these studies further, but also made experiments on animals. These two men were said to have performed human dissections, and their reputation was wide-spread.

The Alexandrian school remained a center for teaching long after the decline of the original spirit of research. Galen sent his pupils there to study the human skeleton. Even in the Middle Ages the fa-

mous "Five Picture Series" of anatomical drawings is said to be in the line of the Alexandrian tradition. However, the greatest exposition of the Alexandrian knowledge is probably found in the works of Celsus.

Aulus Cornelius Celsus was a Roman, of whom we know nothing except that he lived about 30 A. D. His *De Re Medica* consists of eight books on things medical, the only surviving part of a large encyclopedia on many subjects. Celsus discusses the various schools of medical thought, then devotes six books to different maladies and their treatment. In the seventh book he describes the surgical operations used at the time, which probably correspond closely to those practised in Alexandria. Finally, in the last book, Celsus gives us a very complete description of the skeleton, in connection with a discussion of fractures and dislocations. This description, in all probability, represents the instruction available to those students who went to Alexandria to study the human skeleton. Indeed, some authors have suggested that Celsus' work may have been taken directly from a now-lost Greek original.

E. J. HAINES.

ANATOMY IN THE MIDDLE AGES

(Case 3)

FTER Galen there was no scientific anatomic activity for many centuries. A few writers preserved the Galenic tradition in a corrupted form, but there was no access to the facts. The leadership, in whatever intellectual life there was, passed to the Arabic peoples from about the 8th to the 13th centuries. That this was not productive anatomically is evident from an examination of the drawings of that tradition. The rise of the Western universities in the 13th century was at first of no great importance to anatomy, as their achievements were principally literary. Bologna, and later Padua, became the centers of anatomical activity and dissections were probably done at Bologna toward the end of the 13th century. The anatomical material was necessarily limited, and the product of this period is really not very good, when compared with the work of Leonardo and Vesalius. The difficulty for the most part lay in the fact

that the purpose of dissection in the 14th century was to learn and verify the ancient texts. It was really not until the time of Leonardo that the anatomist took up his tools to see what was really there.

Mondino dei Luzzi, anatomist and professor at Bologna, has been regarded as putting anatomy in the Middle Ages upon a scholarly basis, since he wrote for his students, in 1316, an anatomic compendium which remained famous until the beginning of the 16th century. This compendium was without illustrations—at least, nowhere does the text refer to any. If it had not been for the fact that later editions of his work contain plates, we would be less concerned with him. However, the edition exhibited contains 46 plates of diversified subjects. This edition was published at Marburg in 1541 by Christian Egenolph. It is difficult to discern the relation of the text of Mondino to the illustrations, for they are of separate origin. It must be kept clearly in mind that these illustrations were published 225 years after the original text of Mondino. The plates were copied, with slight changes, from the plates of Berengarius da Carpi, by Johann Eichmann, usually called Dryander.

HOWARD W. JONES.

[*Case 3*]

ANATOMY OF THE MIDDLE AGES

ROLAND OF PARMA

Reproduction of "La Chirurgia," the original of which was made *c.* 1250.

MONDINO DEI LUZZI

Anathomia Mundini, published at Marburg in 1541. The plates were made from earlier ones of Berengarius da Carpi by Dryander (Johann Eichmann).

HENRI DE MONDEVILLE

Anatomical miniatures from a French manuscript.

GUIDO DE VIGEVANO

Plates illustrating the technic of dissection, from the *Anatomia* of 1345.

ANATOMY OF THE EARLY RENAISSANCE

(Case 4)

HOULANT describes the period in the history of anatomy extending from 1521 to 1543 as one of "attempts at individually correct anatomic illustrations, which gradually free themselves of schematic and arbitrary features. . . . Artistic anatomy for the instruction of others, as undertaken by anatomists and artists." The value of the woodcut as an adjunct to texts on anatomy was appreciated, and during these twenty years some quite elaborately illustrated works appeared. In so far as it thus contributed to the technique of anatomical representation the period interests us. Otherwise there were few concrete contributions; despite the fact that more dissections were performed than ever before and that thereby various minor misconceptions were corrected, there appeared no force strong enough to rescue the science of anatomy from the slough of Galenic and Arabian tradition. Keeping in mind the influence of such artists in woodcut as Dürer, Burgkman, and Holbein, we proceed to a few of the productions of the period.

Giacomo Berengario da Carpi taught anatomy at Bologna from 1502 to 1527. Although unhappily subservient to Mondino's teachings, he had some skill at drawing and evidently had made more dissections of the human body than had the majority of his contemporaries. His best known works are now very rare *Commentaria* on the works of Mondino which appeared in 1521. He corrected a few of Mondino's errors and by way of illustrations inserted crude woodcuts which some regard as the first drawings from Nature that were used to explain an anatomical text. Most of these illustrations depicted surface and skeletal anatomy, only a few of them describing viscera. Four of these woodcuts are exhibited; they appear in Berengario's *Isogogae*, an anatomical work which appeared in 1523.

The *De Dissectione Partium Corporis Humani* of Charles Estienne, Carolus Stephanus (1504–1564), a student of anatomy at Paris, shows well that this science had progressed as far as it could without a radical change in technique. The work did not appear until 1545, but there is evidence that it was practically completed by 1539; the text is defi-

nitely pre-Vesalian. The illustrations are fine examples of the execution of the woodcut, but are nearly valueless as aids to anatomical study. The artist appears to have been considerably more interested in his backgrounds and in gaining a pleasing effect than in human anatomy. The illustrations suggest the crying need for an anatomist who could make accurate observations and present them accompanied by illustrations which would do justice to the text. The medium for the illustrations—the woodcut—was already perfected.

An interesting and appealing personage of the period was Giovanni Battista Canano (1515–1579), whom Dr. Harvey Cushing has ranked with Servetus and Vesalius in the anatomical Hall of Fame. A good anatomist, not fearing to take issue even with Galen, in 1541 he came to occupy the chair of anatomy at Ferrara. He planned to published a treatise on the anatomy of the human extremities, and probably in 1542 appeared the first instalment, a small pamphlet of twenty leaves with twenty-seven illustrations from *copper engravings* portraying the muscles and bones of the arm. (This medium was eventally the successor to the woodcut.) Girolamo da Carpi probably made the drawings and Agostino de'Musi engraved them. Not only in the cleanness of execution but in the fundamental method of presentation are the drawings remarkable; for at an expense of space which most previous authors did not countenance, the arm is shown in various stages of dissection. Rather than exhibiting as many muscles as possible in one picture, Canano preferred to direct the attention to two or three at most; the shape and the position of the muscles is the more clearly appreciated. This work had little influence on contemporary anatomy; when Canano became acquainted with Vesalius' *Fabrica* he is supposed to have destroyed all available copies of his own little book, so far did he feel that Vesalius outshone him. Hence only a few copies are extant; the one exhibited is a facsimile of that in Dr. Cushing's possession. The work of Canano interests us chiefly in suggesting that Vesalius was perhaps a product of his time; had he not written the *Fabrica*, there were others, Canano among them, who might have produced an equally important work

PALMER FUTCHER.

[*Case 4*]

Anatomy of the Early Renaissance

GIACOMO BERENGARIO DA CARPI

Isogogae breves in anatomia humani corporis. Printed by Benedict Hectoris, Bonn, 1523. Plates illustrating the heart from various angles.

CHARLES ESTIENNE, CAROLUS STEPHANUS (1504–1564)

De dissectione partium corporis humani. Printed by Simon Colineus, Paris, 1545. Estienne's full page woodcuts show that at the end of the pre-Vesalian period anatomical illustrations had reached a sort of stalemate. The woodcut had become developed until it more than met the demands upon it; a lack of careful dissections and accurate illustrations was delaying the game.

GIOVANNI BATTISTA CANANO (1515–1579)

Musculorum humani corporis picturata dissectio (Ferrara 1541–1542?). Plates from copper engravings (a new technique at that time). A pre-Vesalian text of great merit.

WOUND MAN

Facsimile edition of the *Fasciculus de Medicina*, 1493, of Johannes de Ketham.

JOHANNES DE KETHAM

Original later edition of the *Fasciculus*, printed in Venice in 1500.

PETRUS DE ABANO

The first representation of the abdominal muscles, from *Conciliator differentiarum*, 1496. (In Sudhoff's *Archiv für Geschichte der Medizin*, Bd. III.)

MAGNUS HUNDT

A reproduction of visceral drawings from *Antropologium*, printed in Leipzig in 1501.

JOHANN PEYLIGK

Reproduction of drawings of the internal anatomy of the head, thorax and abdomen, from *Compendiosa capitis physici declaratio*, Leipzig, 1513.

THE RENAISSANCE

Leonardo da Vinci

(Case 5)

HE *Quaderni d'Anatomia* shown are a facsimile reproduction of Leonardo da Vinci's anatomical and mechanical drawings and notes. They were edited by three Norwegians—C. L. Vangensten, A. Fonahn, and H. Hopstock—from the collection of Leonardo's papers in the Queen's Library at Windsor, and contain, besides the reproductions, an Italian and English translation of the notes, many of which are in mirror writing. The first volumes appeared in 1916. It is probable that these drawings do not represent Leonard's best and most finished work, but are rather rough sketches which he planned to work up for publication. At the time of his death he was planning a 120-volume encyclopedia of anatomy for the use of artists and medical students, a project characteristic of him in its immensity and impracticability. At his death in 1519 the papers came into the possession of his devoted pupil Melzi, who guarded them carefully until 1570. His heirs, however, cared little for them, and thirteen volumes were stolen by a Garadi preceptor in the family. Seven of these were returned and eventually offered to the king of Spain at Madrid, but were evidently not accepted, and they were finally bought by Count Arundel and came into the possession of the Royal Library at Kensington (moved to Windsor in 1636). Here Dalton discovered them accidentally in a drawer with some sketches of Holbein in 1750.

Leonardo was born in 1452 at Vinci, and was brought up in his father's family in Florence. He was apprenticed at an early age to Verrocchio. Later he worked with Marcantonio della Torre, who was professor of anatomy, first at Padua and then at Pavia. Through him he doubtless acquired much experience in anatomy, and since della Torre was a great admirer of Galen, Leonardo, too, must have felt that influence strongly.

His drawings, especially when compared with those of his contemporaries, are remarkable for their accuracy and truth and fact. The notes accompanying them show that Leonardo did a great deal of experimentation. He worked out the mechanics of the semilunar

valves as well as physiologists have been able to do to this day through the application to the heart of his principles of hydrodynamics. In spite of the fact that he had to work without the help of a microscope, and that he made many mistakes, his ideas have enriched anatomy and physiology enormously.

DOROTHY CROSS.
KATHERINE KNOX.

Andreas Vesalius

Andreas Vesalius, dubbed Bruxellensis by some patriotic citizens, was born in 1514. His father was a court physician-apothecary, a position which later was to give Vesalius entrée into that social and political body. His mother seems to have been a sort of power behind the throne, encouraging the youth, preserving his manuscripts and generally being the true maternal influence. His schooling took him to Paris and Louvain. In the former place he studied under Du Bois (better known as Jacobus Sylvius) and others who were later to become his bitterest foes; and it was here that he assembled his first complete skeleton, the grisly relic of an avian feast. Soon, however, he outgrew his teachers and so he migrated to Italy, to Venice and Padua, where he ascended to the chair of anatomy immediately after he received his degree. While at the latter place (1538) he published his "Tabulae Anatomicae Sex," a frankly Galenic recapitulation in which the future anarchist and despoiler of authority could not be distinguished.

In 1543 at the ripe age of 28, Vesalius published his justly famous "De Humani Corporis Fabrica." In this work the young anatomist burst forth with all the unrestrained vitality of early maturity, coupled with wisdom. He overthrew with one fell swoop not only his own previous work, but, more important still, the works (anatomical) of Galen and much of hoary Galenic authority. His beautiful muscle plates showed themselves to be based on actual dissections of the human cadaver, his skeletons an intimate knowledge of the bony scaffolding. True it is that he erred to no small extent in many details of the vascular and nervous systems and viscera, but his descriptions of heart, lungs and brain are very good; and in the last chapter of the seventh volume he brings his effort to a close with a treatise on the

dissection of living animals. His popular "Epitome" followed late in 1543.

These two books occasioned such a protest from his colleagues that, after a brief lecture tour in behalf of his work, he withdrew, married, went into practice as private physician to Charles V, and stagnated until he had occasion to peruse the Fallopian "Observationes anatomicae" in 1561. Shortly after this, according to a tradition, he had trouble with the Spanish Inquisition over performing a post-mortem on what turned out to be a still-living subject, and, as a consequence, started on a pilgrimage to Jerusalem. While on his way he received a call to accede to Fallopius' chair at Padua, but he was shipwrecked and died of exposure on an island in October, 1564, before he had an opportunity to accept this last honor.

Vesalius did not break away completely from the Galenic tradition, but he broke a path pioneer-fashion. Even a casual examination of the *Tabulae Sex* and the *Fabrica* will show the enormous difference of conception which came in five years. His *chef d'oeuvre* was illustrated by Jan Stephan van Kalkar, a pupil of Titian, an artist said by Choulant to be the first to attain the true anatomic norm. Regardless of this, evidence points to the fact that it is Vesalian effort and Vesalian vision which are rampant even in the plates. He demanded truth of detail. He was the chief promulgator of the scientific method as applied to anatomy, and it is for this reason that he is known as the "Father of Anatomy."

JAMES HAVILAND.

[*Case 5*]

ANDREAS VESALIUS

De Humani Corporis Fabrica, first edition, Basel, 1543. Woodcuts by Jan Stephan van Kalkar. 2nd and 3rd skeleton plates.

Fabrica, edition of Boerhaave and Albinus, Amsterdam, 1725. Copperplate by J. Wandelaar. 5th muscle plate with simian rectus.

The same, plate of instruments, Vesalian *Wundenmann* and contemporary military first aid and surgery.

Fabrica, third edition, Venice, 1568. Kalkar's woodcuts copied by Krüger. Brain sections showing ventricles and floor of cranium.

Fabrica, fourth edition, Venice, 1604. Page by page reproduction of 1568 edition. Plate shows Vesalian conception of the portal circulation.

Fabrica, Fontanus edition, Amsterdam, 1642. Copperplates apparently from an earlier German edition, with many inferior reprints. 1st muscle plate.

Tabulae Anatomicae Sex, German reprint, 1920, by Holl and Sudhoff. Woodcuts attributed to Kalkar. Plate shows pre-Fabrician Galenic concept of arteries.

Epitome, 1st German edition, 1544. Plates from same blocks as the *Fabrica*, showing the vascular system surrounded by organs to be cut out and pasted on figure.

Five photographs of plates in the *Epitome*. Male and Female nudes attributed to Titian—vascular and organ systems to Kalkar.

Copies of figures from *Epitome*. Titian nudes and vascular systems with organs superimposed as intended to give three-dimensional aspect.

SIXTEENTH CENTURY

(Case 6)

URING the latter half of the 16th century occurred one of those phenomenal periods frequently found in the history of sciences, during which knowledge is acquired so rapidly that it becomes incomprehensible. The Renaissance had brought with it a renewed interest in scientific fields, thus giving anatomy its first acceleration; artists had suddenly developed an interest in the human form, creating a demand for dissections and also for better representation of facts observed; finally, Vesalius had demonstrated in his dissections a new technique for all future anatomists and had accurately perpetuated his work for posterity by employing an eminent artist to illustrate his anatomical text.

The impetus thus given to anatomy resolved itself into many schools which sprang up all over Italy, the great school of Padua being the Mecca to which all future anatomists turned for inspiration. Gabriel Fallopius, Realdus Columbus, and Fabricius ab Aquapendente are outstanding names to be found in its archives. In addition to Padua, we have the school at Rome with Eustachius as its satellite: Naples with Ingrassia, the discoverer of the stapes bone: Bologna with Arantius and Varolius of Pons Varolii fame: finally, we have the Spanish school established by Valverde, a pupil of Rome.

Thus we see the study of gross anatomy at its height. The Italian schools hold sway, passing the traditions from master to pupil, from generation to generation until, at last, knowledge reaches its limits with

the methods now available: men eagerly await the discovery of the microscope and the correlation of the physiologist.

G. E. SEEGAR.

[*Case 6*]

SIXTEENTH CENTURY

BARTHOLOMAEUS EUSTACHIUS

Bernardi Siegfriedi Albini: explicatio tabularum anatomicarum Barth. Eustachii. Engraved plates by Eustachius and Pinus. 4th edition, Leyden, 1744.

GIULIO CASSERIO

Frucht im Mutterleibe. Frankfurt, 1707.

GEORG BARTISCH

Augendienst. Rome, 1583. A drawing of the layers of the eye, by one of the first modern ophthalmologists.

HIERONYMUS FABRICUS AB AQUAPENDENTE

Opera omnia anatomica et physiologica, Leipzig, 1687. Placentae.

VALVERDE DI HAMUSCO

Anatomia del corpo humano composita, Rome, 1560. Diagram of superficial veins and arteries.

GABRIEL FALLOPIO

De morbo gallico, 1st edition, 1564.

ADRIANUS SPIGELIUS

De humani corporis fabrica, Venice, 1627. Plates by Joannes Cornelius. Diagram of the Spigelian lobe of the liver.

SEVENTEENTH CENTURY

(Case 8)

PURE individualism was the most noticeable feature of the discoveries of the 17th century. Europe was rife with wars and rebellions, and though contributions in all fields to the advance of civilization were distinctly momentous, they were decidedly few, as is always true of a period of war and social upheaval. Endeavours in the field of medicine were no exception to this rule.

No greater influence on the course of medicine is recorded than William Harvey's discourse on the circulation of the blood, *Exercitatio*

anatomica de motu cordis et sanguinis in animalibus, published in Frankfurt in 1628. The first edition has two plates, each with two figures, indicating the valves which regulate the flow of the blood as it is pumped by the heart, and the behavior of these valves when pressure is exerted below them on a ligated limb. Though a great many men such as de Graaf, van Helmont, Borelli and Sydenham made significant contributions to the sciences of physiology and internal medicine, Harvey's discovery is the only one having great moment in the history of the knowledge of gross anatomy that took place in the 17th century.

A full discussion of Fabricius of Aquapendente will be found in another part of this catalogue. His embryological treatise, with plates reproduced by copperplate engraving in the edition of 1600, was a significant opening to this century of individuality and discovery. (In this century, the woodcuts of the Vesalian period were almost entirely replaced by copperplate engraving.)

The birth of a new craft—a new science, if you will—took place in the 17th century, though it had actually been many centuries in developing. By one of those unexpected whims in which chance indulges, it occurred to someone—Kircher, Galileo, Borelli, it matters little who—to look at life through a magnifying glass. Few enough found it practicable or even possible to devote their scientific exploration to the small area under such a glass, and only one man made a significant contribution to the knowledge of human anatomy by work with a microscope. That man was Marcello Malpighi (1628–1694), physiologist and anatomist at Bologna, a gentle, patient researcher, who, before studying the minute structures under his very simple glass, made interesting and self-instructive observations on the physiological properties of the liver, the kidneys, the spleen, the tongue, and the layers of the skin. He worked alone, and uninfluenced by the theories and practice of others, he discovered through his microscope the tiny blood vessels, or capillaries, which were the only link in the circulatory theory that Harvey had been unable to weld, having no satisfactory means of magnification, In 1660, having experimented with the lungs of a frog, which are transparent and easy to observe at a time when methods of injecting and cross-sectioning were unknown, he wrote to his friend and mentor Borelli, two letters concerning some observa-

tions of these lungs made through the microscope. In 1661 these two letters were published at Bologna, with the title *De Pulmonibus*. Unfortunately, the drawing of the frog's lungs in our available editions is only just enough to persuade us that he really saw the capillaries, though he had to infer their actual use, as his glass was not strong enough to see the blood cells flowing through.

There are other famous names and discoveries in the story of 17th century microscopy—Leeuwenhoek and bacteria, Hooke and plant-cells, Swammerdam and red blood-corpuscles and the magnificent *Biblia Naturae*—but these have no bearing on gross anatomy. All these men worked as individuals, each uninfluenced by, and almost ignorant of, the work of the others. Microscopy of the 17th century did little in the interests of humanity but corroborate and add the Q. E. D. to the almost proven statements of earlier anatomists, and showed a myriad of wonders to incredulous eyes. It remained for the 19th century to put the microscope to its invaluable service in the field of bacteriology and in the birth of preventive medicine.

HELEN C. BROOKE.

Early Embryology

ODERN embryology may be thought of as being effectively founded by Volcher Coiter (1534–1576) during the 16th century. With the exception of a few observations by Albertus Magnus in the 13th century, Coiter's remarkably lucid account of the development of the hen's egg, and the gross formation of its various parts, was the only work of its kind since Aristotle.

Another pupil of Fallopius who exhibited a taste for developmental studies as keen as that of Coiter was the more famous Hieronymus Fabricius (1537–1619), usually called Fabricius ab Aquapendente after the small Tuscan village where he was born. Fabricius was the author of the first illustrated work on embryology, "On the Development of the Eggs of Birds," which is a magnificent study of the intricate formation of the chick within the egg. The memoirs of Fabricius are characterized by their wealth of large clear copperplate illustrations which long remained unexcelled in this field.

Fabricius carried the subject of embryology far beyond where Coiter had left it, and elevated it to stand as an independent science. In his illustrations, Fabricius does not seem to have made use of a lens or magnifying glass, so that his descriptions of the earlier stages of the development of the chick cannot be expected to excel those of Coiter. Harvey, in his treatise *On Generation* was considerably influenced by this great work of his master, Fabricius.

However, for improved and more accurate observation of earlier development, the work of Marcello Malpighi was distinguished. His observations on the incubated egg foreshadowed some of the more important general lines of subsequent embryological research and gave a more exact foundation of knowledge on which to build. Malpighi applied his microscope to the earlier germ of the animal body, and accurately described with copious illustrations the development of many of the organs, but in particular the heart and the nervous system.

In 1673 Malpighi published in London his first work "On the Formation of the Chick in the Egg." Thirteen years later, in 1686 he published extensions and corrections of this work. His observational acuity is beautifully brought out in the plate in which we see clearly defined the minute structures of the whole embryonic area at about the end of the second day of incubation. The contributions of Malpighi to embryology were very numerous and most important, yet it was not until the middle of the 18th century that the knowledge of the developing embryo was pushed beyond where Malpighi had left it.

EDWARD F. LEWISON.

[*Case 8*]

SEVENTEENTH CENTURY

MARCELLO MALPIGHI

De Pulmonibus, from an edition of the *Opera Omnia* published in London in 1686. Illustrating the famous experiment with frog's lungs whereby Malpighi discovered capillary anastomosis.

ANTONJ VAN LEEUWENHOEK

Opera Omnia, Leyden, 1722. Capillary circulation in the tail of an eel.

WILLIAM HARVEY

Exercitatio anatomica de motu cordis et sanguinis in animalibus. 1st edition, 1628.

ROBERT HOOKE

Micrographia, London, 1665. 1st edition. Plant cells in cork, observation 18.

WILLIAM HARVEY

Anatomical exercitations concerning the generation of living creatures. London, 1653.

HIERONYMUS FABRICIUS AB AQUAPENDENTE

Opera omnia anatomica et physiologica, 1687. Embryological plate.

MARCELLO MALPIGHI

Opera Omnia, 1687. De Ovo Incubato, plates illustrating the appearance of a chick embryo on the second day of incubation.

EIGHTEENTH CENTURY

(Case 7)

YSTEMS and theories characterize the 18th century. It opened with the strong influence of Newton from the preceding century, with the idea of Laws, weighing and measuring, applied to everything in science, including music and literature as well as medicine.

The medical literature was of great extent, with endless books and pamphlets attacking and defending theories. Except for Morgagni, Hales, the Hunters, Wolff and Jenner, speculative philosophy dominated this period of theories and systematizers. Stahl's theory of animism, derived from van Helmont's idea of a "sensitive soul," was finally merged with the theory of vitalism, arguing the innate impulse in living creatures towards self-development and reproduction. Similar theories were those of Glisson and Haller, citing the doctrine of irritability as the specific property of living tissue (modern phrase "nerve force" supplanting Galenic "animal spirits"); and Hoffman's theory of iatrochemistry. Of far more value, however, was the school of systematists, led by the physiologists Haller, Hales and Frank. These schools received healthful stimulation from the philosophic works of Locke, Kant, Voltaire and Rousseau.

Advances in the study of anatomy and clinical medicine featured the development of medical education. Mid-Europe was unquestionably, at the opening of the century, the seat of medical science. Paris, because of the interest there in surgery, stood out, but the period of

consolidation in education led to the rise of Leyden, in Holland, under Boerhaave. Under this man, considered to be the father of European medicine, studied such men as Alexander Monro, Van Swieten, de Haen and Haller, four of the outstanding medical men of the century. Monro is credited with starting the famous school at Edinburgh, while the name of Van Swieten is closely connected with the rise of the old Vienna school. In spite of the lack of precision, internal medicine was superior to surgery because the systematic tendencies led to systematized text-books, descriptions of new diseases and general advances in all fields.

Descriptive gross anatomy advanced only along lines of minor importance. Anatomical research was not so brilliant as in the preceding century. Surgical anatomy was expressed in atlases, published privately as gifts to the profession. The best specimens of anatomical illustration show a transition from copperplate to steel engraving which has been unsurpassed since. These are shown in the various atlases and folios.

Until the time of John Hunter, in England, the status of surgery was low in all countries except France, where classes were maintained by royal gifts. Few clinicians are to be noticed, due to the interest in establishing a vitalistic theory. The revolution had a marked effect on the medical profession. In Italy, Scarpa was an eminent surgeon, anatomist and illustrator. In Germany the practice was in the hands of barbers, executioners and wandering bone-setters, until the influence of Frederick the Great established a school for the training of military surgeons. Peter the Great tried unsuccessfully to nationalize Russian medicine. The world-famous school of the Hunters in England came to dominate the study of surgery after legal restraints were placed on practitioners.

The work of Morgagni in pathology did much to correlate the symptoms before and after death, which had previously been based on speculative medical theory. Progress in diagnosis was further made by the development of the stethoscope by Laennec (1819) and the method of percussion, introduced and fostered by Auenbrugger (1762). The former did much to develop technique by exploring the chest for physical signs of disease.

The stationary position of society created a "golden age" for the

practitioner. He was in many cases given an annual fee for continual services and practice was handed down from father to son or favorite pupil. Under these circumstances the physician was not exposed to commercial competition, and his social status was better than now.

The tendencies of the age were artificial and theoretical rather than realistic, but there was a certain emphasis on the practical side in the systematization. Microscopic research and cellular anatomy were left to the next century, and surgery had to wait for the advent of antisepsis, but the latter appeared for the first time as a science rather than an art. In the main, it can be said that these conceptions of the 18th century remain: the minor advance of gross anatomy; the great advance of physiology, pathology, and even histology; the philosophical doctrines introduced to explain the ultimate source of life and death; and the rise of practical medicine to a dominating position.

WARD BRIGGS

[*Case 7*]

EIGHTEENTH CENTURY

JOHN HUNTER

Observations on certain parts of animal oeconomy. London, 1786.

BERNHARD SIEGFRIED ALBINUS

Icones ossium foetus humani, Leyden, 1737.

WILLIAM CHESELDEN

Osteographia, London, 1733. An interesting plate showing Galen gazing at the skeleton of a robber.

WILLIAM HUNTER

Anatomic lectures, London, 1784.

ANTONIO SCARPA

Reflexions et observations sur l'aneurisme, Paris, 1813.

NINETEENTH CENTURY

INETEENTH century anatomy is largely based on the new inventions and detections in physics and chemistry. Most facts of macroscopic anatomy were already well known at the beginning of this century, but the improvement of the microscope and the invention of various methods of histological staining opened a new field of investigation. As early as 1827, Carl Ernst von Baer described the human ovum. Some years later Schleiden and Schwann found that the cell was the structural element of both plants and animals. These new discoveries and theories formed the last step in the development of what might be called the anatomical idea. They might be compared to the isolation of the chemical elements. When Darwin published his famous book on the *Origin of Species*, a revolution was started in the field of comparative anatomy. It was not only possible, now, to give minute and detailed description of the organs, but their development could be understood from the embryological as well as the phylogenetic point of view. Ernst Haeckel's famous *Biogenetisches Grundgesetz*, although exaggerated in its formulation, gave an excellent hypothesis for further research.

The second half of the 19th century showed the results of this fundamental work. It is not necessary to describe all the facts that were found in the field of human and comparative anatomy. What has been done by men such as Johannes Müller, Henley, Huxley, Waldeyer, still forms the basis of our modern textbooks. Soon it was possible to apply the new findings to other fields of medicine. Virchow's Cellular-Pathologie transferred Schwann's and Schleiden's work to pathology. Physiology could make use of the newly acquired knowledge. The neuron theory was very valuable for neurology. On the other hand, it is true, the improvement of the scientific methods necessitated specialization. Whereas, in former times, anatomy, physiology, and pathological anatomy were in the hands of the same professor, who sometimes even practised surgery and obstetrics, this became impossible now. Thus, it could happen that in some cases anatomy lost the contact with the other branches of medicine. Besides that, anatomy, too, fell under the influence of mechanical ideas, as they were effective

in physics and chemistry. Although specialization was a step which, once inaugurated, could not be stopped, it became the task of the twentieth century to create a closer relationship between anatomy and medicine as a whole.

TWENTIETH CENTURY

(Case 9)

INALLY it can be said that it is the aim of anatomy in the 20th century not only to describe the macroscopic and microscopic structure of the human body, but also to give the anatomical basis for the understanding of the physiological functions and clinical findings. There is a close coöperation between anatomists, physiologists, neurologists, and other representatives of practical medicine. The new experimental embryology does not confine itself just to trace the development but also tries to explain it. The conception of the organs as an anatomical-physiological unit can be clearly seen in the modern anatomical illustrations as represented in our collection by the work of Max Brödel and his pupils.

OWSEI TEMKIN.

[*Case 9*]

TWENTIETH CENTURY

FUNDUS OCULI

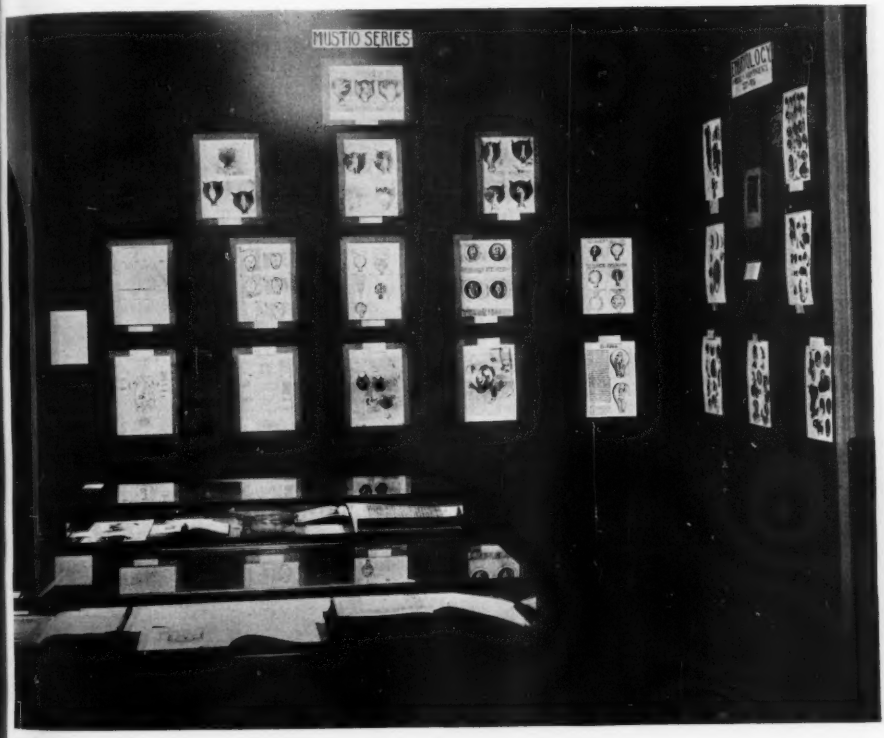
Drawings of normal eye-grounds by Annette Burgess—Albino, European blonde, European tessellated, Chinese, Hindu, American Indian, and pure-blooded Negro.

(Note: The initials in this catalogue were taken from the 1543 edition of Vesalius' *Fabrica.*)

PICTURES ON THE WALL ILLUSTRATING CERTAIN LINES OF ANATOMICAL DEVELOPMENT

MUSTIO SERIES

In the 2nd century A. D., the great Greek physician *Soranus* wrote a famous treatise on obstetrics and gynecology. An abstract of it was made as a catechism for midwives, and was illustrated by pictures showing the position of the child *in utero*.


MUSTIO SERIES

In the 6th century this catechism was translated into Latin by *Mustio*, and this translation proved to be a great success. Many manuscripts containing this text are still preserved, and all of them are illustrated. Throughout the Middle Ages the pictures of Soranus and Mustio served for the teaching of the midwives.

The first break in the tradition is represented by the drawings of Leonardo da Vinci, who for the first time gave accurate pictures of the human embryo. The old Soranus pictures, however, still survived and are to be found in the *Rosengarten* of *Eucharius Rösslin*, of 1513, and even later in the 17th century books.

The two pictures of the *Fasciculus de Medicina* by Johannes de Ketham are interesting in so far as they show that at the end of the 15th century one felt the necessity of giving more realistic pictures. In the first edition of 1491 the picture representing the pregnant woman is still diagrammatic, following mediaeval medical traditions, while for the second edition of 1493 new drawings were made from nature.

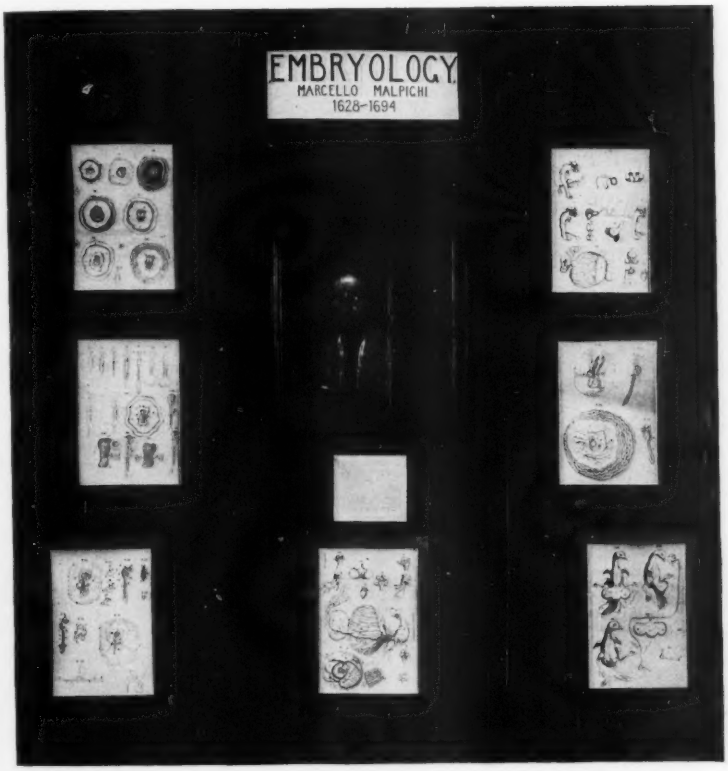
HIERONYMUS FABRICIUS AB AQUAPENDENTE, born in 1537 in the small village of Aquapendente, slightly detracted from his possibilities as an influence on anatomy by carrying on the ideas of Galen at a time when research and revolt against classical authority were the spirit of the day.

As the master of William Harvey, to whom he must have relayed his observations on the valves of the veins, and of Giulio Casserio, and as an effective element in the science of modern embryology, he occupies an important niche in the annals of medicine. From 1565 until his death in 1619, he was professor of anatomy at the University of Padua.

The plates here represented show Fabricius' observations of the development of a chick embryo through some twenty-two days. He used no microscope, and therefore was unable to trace the embryonic development of the adult organs.

The plates are taken from the 1687 edition of his *Opera Omnia Anatomica et Physiologica*.

MARCELLO MALPIGHI was born into a family of small landholders at Crevalcuore near Bologna, in 1628. He studied at the University of Bologna, forming there friendships that lasted throughout his life. His health was poor during the years following, and he made many ene-


EMBRYOLOGY
MARCELLO MALPICHI
1628–1694

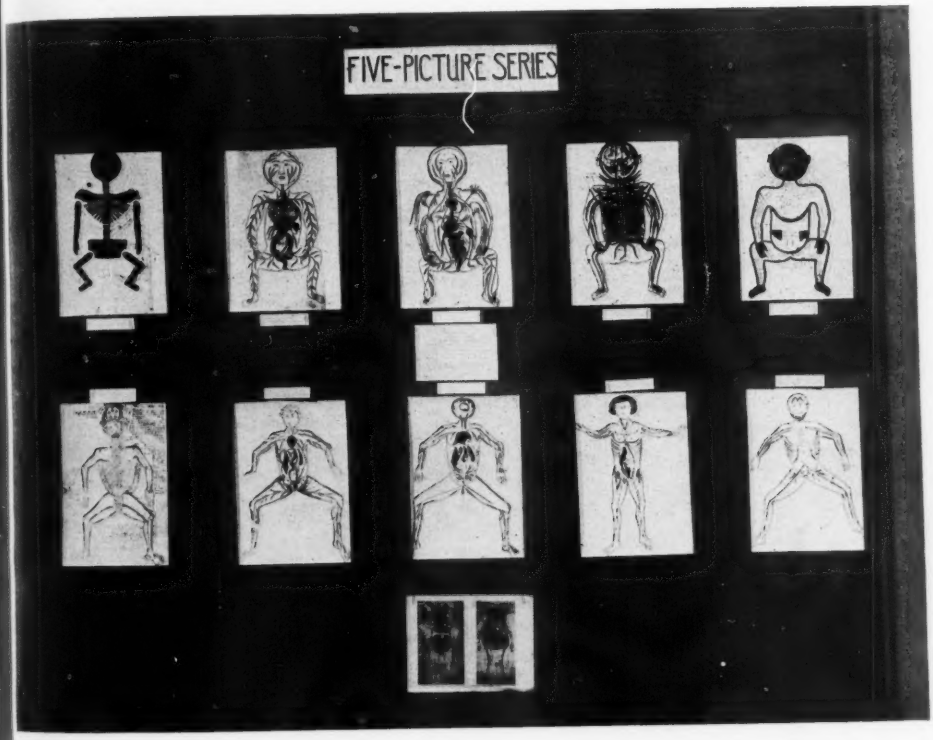
mies, as a result of jealousy due to his university appointments, and his quiet determination to stick to principles for which his associates had no use, despite their obvious logic. He was a brilliant and painstaking experimenter, a biologist *par excellence*, a physiologist, and an anatomist, of which subject he was professor at the University of Bologna from 1660–1662. While there he made the experiment which led to the discovery of the capillaries. He died in Rome, where he had gone to be the physician of Pope Innocent XII, in November, 1694.

The plates here represented illustrate Malpighi's observations in the field of embryology. He followed the growth, as Fabricius had done, of a chick embryo from the first moment of development until the hour of hatching. It is interesting to note the difference between the two observations. Malpighi had the advantage over Fabricius of a microscope, and was more or less able to follow pretty accurately the evolution of the adult organs through the different stages of their embryonic development.

(The portrait of Malpighi in this exhibit was discussed in the article *A New and Hitherto Unpublished Portrait of Marcello Malpighi*, by Michel Pijoan, in the Bulletin of February, 1933.)

FIVE-PICTURE SERIES

This series of five anatomical pictures illustrated a Persian anatomical text, the Tashrîkh-i-Mansûr. The importance of this series is that we find these five pictures not only in the East, but at the same time in the West, illustrating another text. They must therefore have had a common root which must have been in Alexandria. It is probable that, in the late Alexandrian school, diagrammatic anatomical pictures were used for the teaching of students, and that these pictures were copied for centuries in the East as well as in the West. Being copied so often by artists who did not understand what they were doing, they naturally deteriorated. The realistic representation of the embryo *in utero*, however, shows that these pictures originally were made from nature.


FIVE-PICTURE SERIES

ANATOMIES

The dissection of human bodies was practised in the West from the beginning of the 14th century on, first in Bologna, and then in other places. These early dissections, however, were done not for research purposes, but in order to illustrate the textbooks of anatomy. In the picture taken from the *Fasciculus de Medicina*, we see the professor in his chair, the surgeon is dissecting, and the demonstrator is pointing to the parts being dissected.

In the 16th century, however, the attitude changed. Vesalius discovered that the ancient anatomy was animal anatomy, and that one had to investigate the human body. The title page of his book represents him while dissecting a cadaver, surrounded by the students of the University of Padua.

Anatomy scenes were a very popular subject among the painters of the 17th century, the most famous example being Rembrandt's *Anatomy*.

ANATOMIES

A ROMAN MOSAIC—SKELETON

A SKELETON of the 14th century, from the Codex Latinus Monacensis no. 13042, in the Munich State Library.

TWO SKELETONS from the Anatomia Mundini, of Mondino dei Luzzi, published at Marburg in 1541, with plates copied from Berengarius. The original edition, of 1316, had no illustrations.

NÜRNBERG SKELETON of Richard Helain. About 1493.

SKELETONS from the *Quaderni d'Anatomia* of Leonardo da Vinci. From manuscripts in the Royal Library at Windsor.

SKELETON from the *Fabrica* of Vesalius, 1543. Woodcut by Kalkar.

SKELETON from: *Bernardi Siegfriedi Albini: Explicatio tabularum anatomicarum Barth. Eustachii*, 1761.

TABULAE SKELETI ET MUSCULORUM CORPORIS HUMANI, of Bernardus Siegfriedus Albinus, 1747. Plate I, drawn and engraved by Jan Wandelaar.

SKELETONS

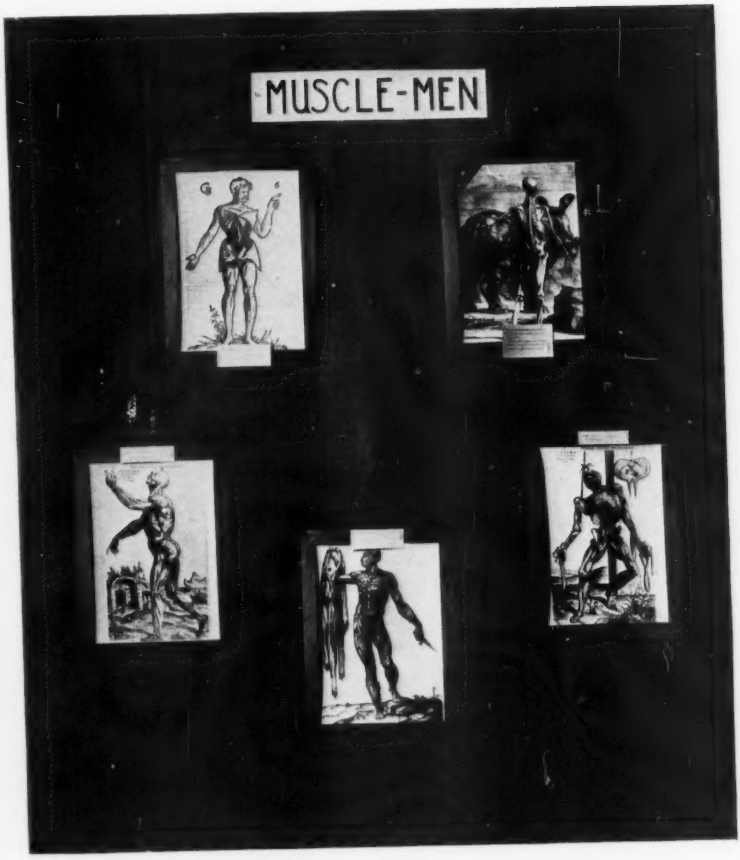
MUSCLE-MEN

ANATOMIA MUNDINI, of Mondino dei Luzzi, Marburg, 1541.

FABRICA of Vesalius, Basel, 1543. 2nd and 7th muscle plates.

MUSCLE-MAN from the *Anatomia del Corpo Humano*, of Valverde, 1586.

TABULA SKELETI ET MUSCULORUM CORPORIS HUMANI of Bernardus Siegfriedus Albinus, 1747. Plate VIII, by Jan Wandelaar.


MUSCLE-MEN

Negro skull: John Osgood.
Head of Human Embryo: James F. Didusch.
Human Embryo—pen-and-ink drawing: James F. Didusch.
Female Pelvic Organs: Max Brödel.
Human Foetus: Max Brödel.
Cross-sections of Injected Kidneys: Max Brödel
Twin Placenta: James F. Didusch
Human Embryo: James F. Didusch
Microscopic View of Tonsils: Max Brödel
Head of Chick Embryo: James F. Didusch
Lining of Stomach: Max Brödel
Muscular Layers of Stomach: Max Brödel.

JOHNS HOPKINS UNIVERSITY
DEPARTMENT OF ART AS APPLIED TO MEDICINE